Sleep awareness and mental health

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ROGERS Behavioral Health

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Disclosures

Christopher Lowden, MD, and Adrianne McCullars, PhD, have each declared that they do not, nor does their family have, any financial relationship in any amount occurring in the last 12 months with a commercial interest whose products or services are discussed in the presentation.

The presenters have each declared that they do not have any relevant non-financial relationships. Additionally, all planners involved do not have any financial relationships.

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Learning objectives

Upon completion of the instructional program, participants should be able to:

1. List the four stages of sleep and at least two functions of sleep
2. Describe at least five sleep hygiene techniques to help with improving sleep
3. Identify at least one pharmacotherapy and at least one cognitive-behavioral intervention used to aid with sleep deficits

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What we'll cover in this webinar

Sleep: An overview
- Sleep architecture
- Neurobiology of sleep
- Functions of sleep
- Recommendations for sleep in adults

Common sleep problems
- Types of sleep problems
- Diversity among sleep problems
- Consequences of sleep deficits and impact on mental health

Targeting sleep-related difficulties
- Overview of sleep hygiene
- Cognitive-behavioral interventions for sleep difficulties
- Pharmacotherapy for sleep difficulties
- Chronotherapy for mood and sleep disorders

Moderated Q&A

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Sleep: An overview

Q&A

Please use the Q&A feature to send your questions to the moderator.

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The mystery of sleep

- An extended period of reduced responsiveness and change in consciousness
- Present in every animal species studied
- Seems counter to evolution: don't eat, reproduce, cannot monitor for danger, and we spend 1/3 of our lives doing it
- The true function of sleep remains uncertain

(Charney & Nestler, 2009)

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What if we don't sleep?

TABLE 16-10 Drunk with sleepiness?

Sleep loss	Equivalent alcohol dose in U.S. beers	Equivalent alcohol level (%)
Post-call pediatric residents	–	0.04–0.05
Normals		
2 hours (i.e., only 6 hour time in bed)	2–3	0.045
Legally drunk		
4 hours (i.e., only 4 hour time in bed)	5–6	0.095
6 hours (i.e., only 2 hour time in bed)	7–8	0.102
8 hours (i.e., no time in bed)	10–11	0.190

(Stahl, 2008)

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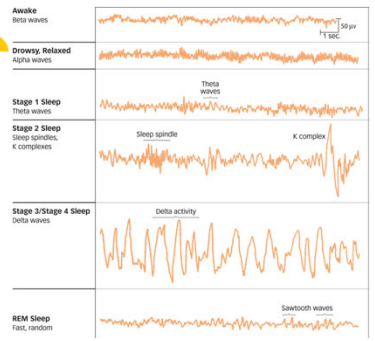
Sleep stages

- EEG allowed our first glimpse into the underlying neurobiology of sleep
- Stages 1-4 and REM sleep
- Electrooculogram (EOG) and Electromyogram (EMG) also provide ways to monitor the body during sleep.



(Charney & Nestler, 2009)

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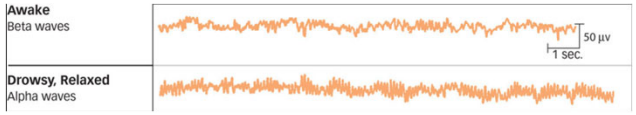
Wakefulness

- Eyes open: low voltage, fast-activity
- Eyes closed: alpha activity – “idling” rhythm
- Both eyes and muscles move voluntarily



(Charney & Nestler, 2009)

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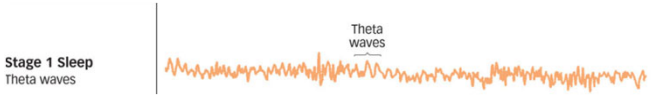
Stage 1

- Transition state
- Loss of alpha activity
- Eye movement slow and rolling, muscles relax
- Subject may deny being asleep



(Charney & Nestler, 2009)

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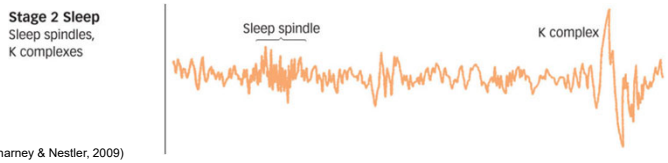
Stage 2

- After a few minutes in stage 1
- Appearance of K-complexes and sleep spindles
- “Fully asleep”
- Arousal threshold increased



(Charney & Nestler, 2009)

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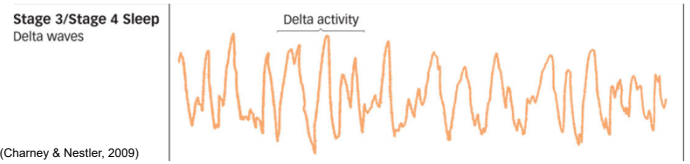
Stages 3 and 4

- Slow wave sleep (3 vs 4 based on proportion of slow waves)
- Eye movements cease
- Muscle movements continue to decrease
- Threshold for arousal higher – process to wake up



(Charney & Nestler, 2009)

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REM sleep

- Burst of eye movement
- EEG similar to awake (paradoxical sleep) – low-voltage fast-activity
- Loss of muscle tone
- Arousal threshold still very high

(Charney & Nestler, 2009)

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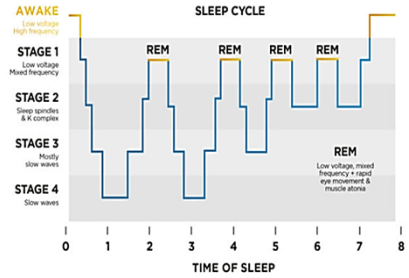
Sleep cycle:
Stage 1 → Stage 2 → Stage 3/4 → Stage 2 → REM

- Stage 1 (5%)
- Stage 2 (50%)
- Stage 3 and 4 (20-25%)
- REM sleep (20-25%)



(Charney & Nestler, 2009)

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Neurophysiology

- Arousal regulated by Cortico-striatal-thalamic-cortical (CSTC) loops by controlling the "thalamic filter"
- Hypothalamus – "sleep/wake switch"
  - "Wake promoter" - Tuberomamillary nucleus (TMN)
  - "Sleep promoter" – Ventrolateral preoptic (VLPO) nucleus
- Lateral Hypothalamus (LAT) – promotes wakefulness
- Suprachiasmatic Nucleus (SCN) – internal clock "sleep pacemaker"

(Stahl, 2008)

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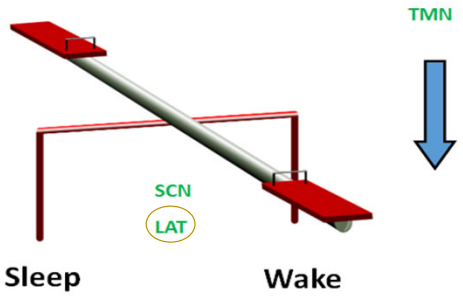
Orexin

- A wakefulness promoter located in LAT neurons
- Lacking in narcolepsy



(Stahl, 2008)

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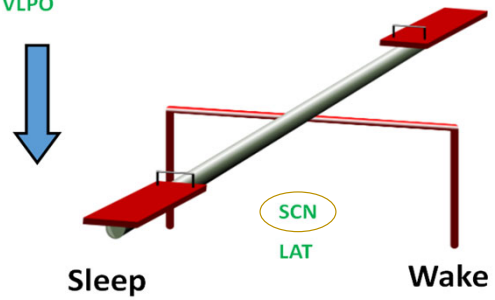
Melatonin

- Hormone that programs the SCN
- Secreted by pineal gland in response to darkness
- Increased amounts throughout the day



(Stahl, 2008)

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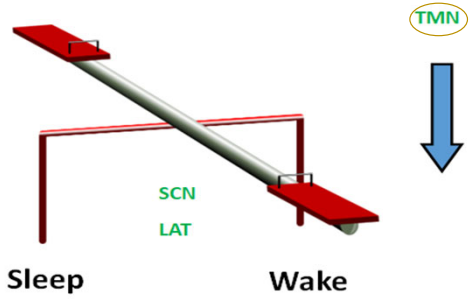
Histamine

- Promotes wakefulness and is pro-cognitive
- Anti-histamines make you sleepy



(Stahl, 2008)

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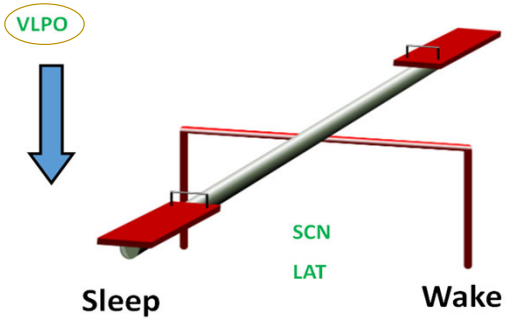
GABA

- Major inhibitory neurotransmitter
- Promotes sleep, inhibits wakefulness



(Stahl, 2008)

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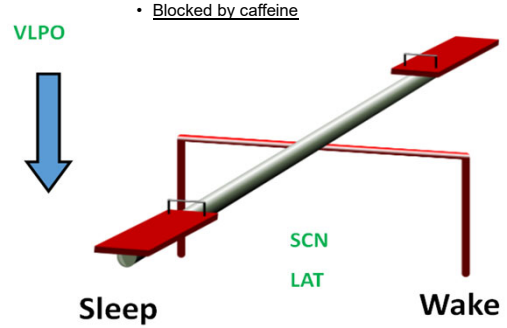
Adenosine

- Novel neurotransmitter
- Accumulates during wakefulness, dissipates during sleep
- Blocked by caffeine



(Stahl, 2008)

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Homeostatic sleep drive

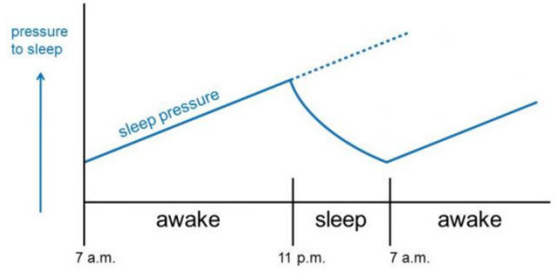

Figure 2.3. Homeostatic sleep drive is the pressure to sleep ("sleep pressure" on graph).

(Centers for Disease Control and Prevention, 2020)

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Circadian rhythm

- Influenced by zeitgebers (time-givers) such as light/dark and other environmental factors
- Circadian rhythm disorders
  - "Phase delayed" – Wake promoter turned ON too late in 24-hour cycle
  - "Phase advanced" – Wake promoter turned OFF too late in 24-hour cycle
- <u>These factors can be artificially influenced</u>

(Zhu & Zee, 2012)

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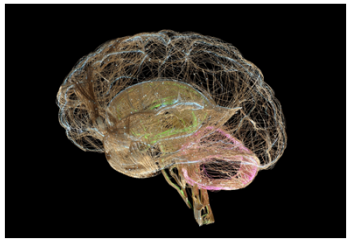
Functions of sleep

Sleep and memory

- Sleep enhances learning
- Sleeping offers context for consolidating memories
- Molecular/Neuronal processes here are unclear
- Unknown if REM sleep has anything to do with this



(Charney & Nestler, 2009)

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Functions of sleep

Sleep and brain restitution

- Sleep may restore "fuel" or energy depleted during wakefulness
- Glycogen fuel stores restored during sleep?
- Replenish presynaptic stores of calcium ?
- If we do not sleep we suffer rapid cognitive impairment

(Charney & Nestler, 2009)

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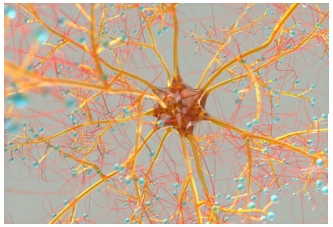
Functions of sleep

Sleep and synaptic homeostasis

- Wakefulness associated with synaptic "potentiation"
- Synapses are getting too strong and start requiring more and more energy
- Sleep prevents synaptic overload to save energy, space, and supplies
- "Downscaling" may be happening during slow wave sleep



(Charney & Nestler, 2009)

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Functions of sleep

Brain development

- Very important during first 1-2 years for brain development
- May be important during REM sleep
- REM sleep tapers off as we get older

(Charney & Nestler, 2009)

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How much sleep?

Age Group		Recommended Hours of Sleep Per Day
Newborn	0–3 months	14–17 hours (National Sleep Foundation)[1] No recommendation (American Academy of Sleep Medicine)[2]
Infant	4–12 months	12–16 hours per 24 hours (including naps)[2]
Toddler	1–2 years	11–14 hours per 24 hours (including naps)[2]
Preschool	3–5 years	10–13 hours per 24 hours (including naps)[2]
School Age	6–12 years	9–12 hours per 24 hours[2]
Teen	13–18 years	8–10 hours per 24 hours[2]
Adult	18–60 years	7 or more hours per night[3]
	61–64 years	7–9 hours[1]
	65 years and older	7–8 hours[1]

(Centers for Disease Control and Prevention, 2017)

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Common sleep problems

Please use the Q&A feature to send your questions to the moderator.

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Sleep disorders: Common characteristics

- Over the course of the lifetime, sleep problems are reported by up to 1/3 of adults and 25% of children and adolescents (Breslau et al. 1996; Owens, 2008)
- Most sleep disorders can be characterized by one or more of the following: (Sleep Foundation, 2020)
  - Trouble falling or remaining asleep
  - Finding it difficult to stay awake during the day
  - Imbalances in circadian rhythm that interfere with healthy sleep schedule
  - Prone to unusual behaviors that disrupt your sleep

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Types of sleep disorders

- Insomnia
- Parasomnias
- Sleep-related breathing disorders
- Hypersomnolence disorders
- Sleep-wake disorders
- Sleep-related movement disorders

(Sleep Foundation, 2020)

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Insomnia

- 10-30% of adults live with some form of insomnia
- Persistent difficulty falling or remaining asleep despite the opportunity and motivation to do so
- Chronic insomnia
  - At least 3 times/week for at least 3 months
- Short-term insomnia
  - Lasting less than 3 months

(Sleep Foundation, 2020)

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Parasomnias

- Unusual behaviors that occur prior to sleep, while asleep, or during the transition between sleep and waking
- nREM related
  - Sleep walking
  - Night terrors
- REM related
  - Sleep paralysis

(Sleep Foundation, 2020)

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Sleep-related breathing disorders

- Abnormal breathing during sleep
- Some are highly disruptive for sleep and can lead to major daytime impairments
- Sleep apnea
  - most common breathing disorder for children and adults

(Sleep Foundation, 2020)

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Hypersomnolence disorders

- Feelings of sleepiness and fatigue during the day despite a healthy circadian rhythm and an adequate amount of sleep the previous night
- Can put people at risk for accidents
- Narcolepsy
  - Most common hypersomnolence disorder

(Sleep Foundation, 2020)

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Sleep-wake disorders

- Category of circadian rhythm sleep disorders
- Tied to a person's internal clock
- Occur in those whose circadian rhythms are misaligned – causing them to feel alert and tired at abnormal times of the day

(Sleep Foundation, 2020)

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Sleep-related movement disorders

- Abnormal movements during sleep that can be disruptive for individuals and their sleep partner
- Cause excessive daytime sleepiness and fatigue due to sleep loss
- Restless leg syndrome is an example of this disorder

(Sleep Foundation, 2020)

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Diversity among sleep problems

Gender

- Women are at a ~40% increased risk for insomnia and developing sleep problems as compared to men (~22%)
- Women are at twice the risk for RLS compared with men
- Men are at twice the risk for sleep apnea than women
- Narcolepsy is more male predominant

(Mallampalli & Carter, 2014)

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Diversity among sleep problems

Ethnicity

- Black/African American individuals at increased risk for insomnia
- More early morning awakenings plus lower sleep efficiency in African American vs. White adults
- Shorter sleep duration and higher rates of sleep apnea in African American, Hispanic, and Asian children and adults as compared to White children and adults
- Earlier start of puberty in African American girls than in Hispanic, Asian, and White girls, which predicted shorter sleep duration

(Grandner et al., 2013; Petrov et al., 2014)

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Diversity among sleep problems

Socioeconomic status (SES)

- Compared to those individuals in more advantageous conditions, individuals who experience economic difficulties, those with lower educational level, and those with lower SES are more likely to experience sleeping problems
- For women – childhood and current SES is significantly related to sleeping problems in later life
- For men – current SES is significantly related to sleeping problems

(van de Straat et al., 2020)

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Sleep deficits and mental health impact

Sleep and mental health have a bidirectional relationship:

MH → sleep problems *and* sleep problems → MH

Many mental health problems are associated with sleep problems (depression is the most researched)

- Symptoms of insomnia are present in 20-40% of individuals with mental illness (Soehner & Harvey, 2012)

Most common comorbidities:

- Major depressive disorder
- Bipolar disorder
- Generalized anxiety disorder / Anxiety disorders
- PTSD
- Schizophrenia
- Alcoholism

(Krystal, 2012; Scott et al., 2017)

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Sleep deficits and mental health impact

- People with insomnia and hypersomnia are *10 times as likely* to develop MDD (Krystal, 2012)
- *75%* of those with depression report symptoms of insomnia (Scott et al., 2017)
- Bidirectional relationships: (Scott et al., 2017)
  - Patients with insomnia w/o depression – OR 6.2 times more likely to develop depression later in life
  - Patients with depression w/o insomnia – OR 6.7 times more likely to develop insomnia later in life
  - Patients with insomnia and mood disorders:
    - 41% insomnia preceded the mood disorder
    - 29% mood disorder preceded insomnia

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Sleep deficits and mental health impact

- N = 5,692
- Those with comorbid mood and anxiety disorders had significantly higher rates of severe insomnia complaints (42.1-62.8%) as compared to 3 other groups
- Severe insomnia complaints were also more prevalent in individuals with mood (25.2-45.6%) or anxiety disorders only (24.9-45.5%) relative to those with no disorder (12.4-24.3%)
- Severe insomnia complaints in past year was associated with increased days of impairment for those with mood-anxiety comorbidity

(Soehner & Harvey, 2012)

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Sleep deficits and mental health impact

Insomnia is the most common sleep disturbance associated with anxiety disorders

- Those with insomnia are at double the risk of developing an anxiety disorder (Krystal, A.D., 2012)
- Of those individuals meeting criteria for an anxiety disorder, 70-90% of those experienced insomnia (Soehner, A. M., & Harvey, A. G., 2012)

90% of individuals diagnosed with PTSD reported symptoms of insomnia (Scott, A. J., Webb, T. L., & Rowse, G., 2017)

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Sleep deficits and mental health impact

- Sleep disturbance can increase risk for suicidal behaviors
  - Considered one of the top 10 warning signs of suicide by SAMHSA
  - Insomnia and nightmare symptoms may serve as modifiable risk factors for suicidal behaviors
- The relationship between suicidality and sleep disturbance has been shown even in the absence of mental health

(Bernert et al., 2015)

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Targeting sleep-related difficulties

Q&A Please use the Q&A feature to send your questions to the moderator.

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Why treating sleep is important

- A disturbed sleep pattern predicts poor response to psychotherapy more than the severity of depression
- Insomnia is a risk factor for relapse in patients who are treated for depression
- Treating insomnia with CBT in patients with depression results in decrease of depression scores, decreased relapse, and improved remission rates

(Neckelmann et al., 2007)

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Cognitive and/or behavioral interventions

- Sleep hygiene
- Cognitive restructuring
  - To address sleep related beliefs
- Sleep restriction
- Stimulus control

} Key components of CBT-I

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3P model for insomnia

- Predisposing factors (traits)
  - (e.g., genetics, "wiring")
- Precipitating factors (states)
  - (stressful event)
- Perpetuating factors (behaviors)
  - (behaviors that cause insomnia to persist)

(Spielman et. al., 1987)

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Predisposing factors (traits)

- Genetic vulnerability
- Personality traits
  - Type A, anxious, hyperarousal
- Medical and psychiatric problems
  - Anxiety disorders, depression
- Gender
  - Being female
- Age
  - Being older

(Spielman et. al., 1987)

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Precipitating factors (states)

- Acute stress life events
  - Psychosocial stressors (e.g., financial, marital, job-related)
  - Acute safety concerns
  - Onset or worsening of medical or psychiatric conditions

(Spielman et. al., 1987)

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Perpetuating factors (behaviors)

- Things one does to try to get more sleep at night
  - Going to bed early, sleeping in, drinking alcohol
- Things you do the next day to make up for limited sleep
  - Avoiding exercise, reducing activity in general, taking a nap, drinking caffeine
- Anything you do in bed that is not sleeping
  - Reading, electronics, TV, talking with bed partner, worry, feeling frustrated, problem solving

(Spielman et. al., 1987)

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Perpetuating factors change…

I'm in bed, and I'm asleep

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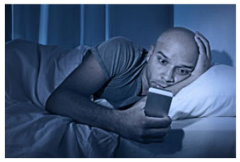
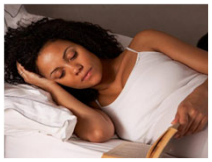
Into…

I'm in bed, and I'm…


Likely doing things other than sleeping…

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Also…

I'm in bed, and I'm …

- Hopeless
- Frustrated
- Anxious
- Angry
- Depressed

Likely feeling things not conducive to sleep…

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Basically:

I'm in bed, and I'm AWAKE!

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Conditioned arousal

- Bed/bedroom becomes associated with physiological arousal due to repeated pairing with feelings of frustration, anxiety, hopelessness, etc.


NOT in bed

IN bed

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CBT-I

- Recommended as practice standard and first-line treatment for insomnia
- Found to be as effective as medication for brief treatment and more reliable and durable over time
- Key components: sleep hygiene, cognitive restructuring, stimulus control, sleep restriction
  - Sleep restriction is contraindicated in the following, bipolar disorder, untreated sleep apnea, parasomnias, and seizure disorders and should be modified in these cases

(Khurshid, 2018; Morin, 2004; Morin et al., 1994)

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CBT-I

- 70-80% of patients with even very long-term poor sleep benefit from CBT-I
- More than 100 RCTs over 30 years
- Good long-term outcomes: 80% maintain gains
- 85% of long-term nightly Rx users were able to eliminate Rx altogether using CBT-I combined with gradual tapering protocols

(Morin, 2004; Morin et al., 1994)

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Sleep hygiene

What is sleep hygiene?

- Series of healthy sleep habits that can help improve ability to fall asleep and stay asleep
- Important part of CBT
- Most effective treatment for those with chronic insomnia

(American Academy of Sleep Medicine, 2020)

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Sleep hygiene

How much sleep do I need?

- Infants 4 months to 12 months should sleep 12 to 16 hours per 24 hours (including naps)
- Children 1 to 2 years of age should sleep 11 to 14 hours per 24 hours (including naps)
- Children 3 to 5 years of age should sleep 10 to 13 hours per 24 hours (including naps)
- Children 6 to 12 years of age should sleep 9 to 12 hours per 24 hours
- Teenagers 13 to 18 years of age should sleep 8 to 10 hours per 24 hours
- Adults should sleep 7 or more hours per night

(American Academy of Sleep Medicine, 2020)

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Sleep hygiene: Tips

- Get regular
- Sleep when sleepy
- Get up and try again
- Avoid caffeine and nicotine
- Avoid alcohol
- Bed is for sleeping
- No naps
- Sleep rituals
- Bath time
- No clock watching
- Use a sleep diary
- Exercise
- Eat right
- The right space
- Keep daytime routine the same

(Centre for Clinical Interventions, 2020)

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Cognitive restructuring

Negative sleep thoughts:

- I'll never be able to sleep without pills
- This is going to be another terrible night

Positive sleep thoughts:

- I will be sleeping better as I learn new techniques
- These techniques have worked for others, and they will work for me

Track negative sleep thoughts and replace them with positive sleep thoughts

(Morin et al., 1994)

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Stimulus control

- Intends to reestablish the associate between being in bed and being asleep (bed = sleep and relaxation)
- Prescribes patients to get out of bed and engage in a relaxing activity outside of bed/bedroom anytime they
  - Are not asleep within 15-20 minutes after going to bed
  - Are clearly awake
- Patients are told to only return to bed when they are so sleepy that they can hardly keep their eyes open/are nodding off
- Patients are told to only engage in sleeping and sexual activity in the bed/bedroom

(Morin et al., 1994)

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Stimulus control

- People spend less time in bed awake
  - Weaking the conditioned association between being in bed and being awake
  - Weakening the conditioned association being in bed and experiencing physiological arousal
- People spend more time in bed asleep
  - Rebuilding the association between being in bed and being asleep

(Morin et al., 1994)

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Sleep restriction (AKA Sleep scheduling)

- Calculated based on sleep log completion
- Working to spend less time in bed
  - Until sleep efficiency is 85% (total time asleep/total time in bed)
  - Ex: 6 hours of sleep but 8 hours in bed = 75% efficiency
- Never sleep restrict less than 6 hours – this increases as sleep efficiency improves
- If sleep efficiency is <80%, patients need further sleep restriction

(Morin et al., 1994)

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Case example

Mikayla is a 26yo female competitive skier. She has no known psychiatric history however has developed insomnia each night before a race. Immediately upon going to bed she becomes anxious and begins to think about getting enough sleep so that she can perform her best on race day. This problem has led to some recent problems with focus during the day which has led to underperformance in her competitions. She is seeking help to get better, more consistent sleep.

What are some treatment considerations as you approach Mikayla's case?

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Pharmacotherapy for insomnia

- "Hypnotics" are medications that treat insomnia
- Can occur intermittently or become chronic
- Psychiatric disorders commonly cause sleep problems
- Untreated insomnia can increase risk of symptom relapse
- Want to get length of effect "just right"
- Risk of "hangover" or ongoing effects into the morning

(Stahl, 2008)

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Pharmacotherapy for insomnia

Benzodiazepines
(*flurazepam, quazepam, triazolam, temazepam, estazolam*)

Cons:
- Loss of efficacy over time
- Tolerance/withdrawal
- Rebound insomnia
- Cognitive effects

Pros:
- Can be effectively used with close monitoring
- May be a good second (or third) line agent

(Stahl, 2008)

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Pharmacotherapy for insomnia

GABA A positive allosteric modulators ("Z drugs")
(*eszopiclone, zaleplon, zolpidem, zolpidem CR*)

Cons:
- Amnestic side effects
- Few guidelines

Pros:
- Binds to GABA receptors in a way that does not cause tolerance/withdrawal
- May improve remission rates of some disorders

(Stahl, 2008)

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Pharmacotherapy for insomnia

Melotonergic agents (*melatonin, ramelteon*)
- Melatonin OTC dose not always reliable
- Affect circadian rhythm

Serotonergic agents (*trazodone*)
- Very commonly used
- No risk of tolerance/withdrawal
- May increase slow wave sleep
- Affects 5HT2A, H1, alpha 1 adrenergic

(Stahl, 2008)

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Pharmacotherapy for insomnia

Anti-histamines (many)
- Diphenhydramine, hydroxyzine
- Several antidepressants and antipsychotics

(Stahl, 2008)

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Chronotherapy

- "Hacking" the circadian rhythm
- Manipulate zeitgebers (time-givers)
- Regular circadian/ultradian rhythms thrown off when natural zeitgebers are lost

(Zhu & Zee, 2012)

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Chronotherapy

Treating sleep disorders

- Morning bright light, evening melatonin – Delayed Sleep Phase
- Evening bright light – Advanced Sleep Phase

Melatonin

- Doses of 3-5mg initially
- Doses of 0.5mg for maintenance

(Zhu & Zee, 2012)

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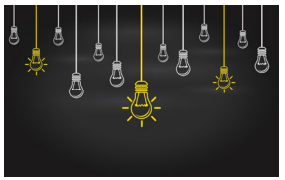
Chronotherapy



Light therapy (Phototherapy):

- Light intensity – 10,000 lux
- Duration of exposure – 20-30 minutes
- Time of day of exposure – 40 minutes after sunrise
- Spectral composition – UV-filtered full spectrum
- Field of illumination – Above head and shining down

(Zhu & Zee, 2012)

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Chronotherapy

For depression / seasonal affective disorder (SAD)

- Can-SAD Study – RTC Light therapy vs. fluoxetine
- 96 patients in Canada with SAD
- Light and placebo vs. fluoxetine and placebo light
- NO DIFFERENCE in clinical response rates (67%) or remission rates (50% and 54% respectively)
- Both treatments generally well tolerated, but higher instance of side effects with fluoxetine

(Lam et al, 2006)

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Chronotherapy

For mood disorders

- Meta-analysis of RCT of light therapy for mood disorders
- 20 of 173 studies found were included (13%)
  - Bright light or dawn simulators effective for SAD
  - Bright light effective for non-seasonal depression
  - Bright light NOT effective as antidepressant adjunct for non-seasonal depression

(Golden et al., 2005)

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Time for questions and answers…

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Where to get additional information…

AASM American Academy of SLEEP MEDICINE
aasm.org

Sleep Foundation
A OneCare Media Company
sleepfoundation.org

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™
cdc.gov/sleep

Centre for Clinical Interventions
cci.health.wa.gov.au/Resources/Looking-After-Yourself/Sleep

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About the presenters….

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